

of this character and their relations to weather changes. A long series of such observations should also be of value in connection with the study of the effect of weather conditions upon crop growth. The results thus far obtained are therefore published at this time without further discussion.

The observations on the polarization of sky light after sunset in Table 12, and on the polarization at different distances from the sun, in Tables 13 and 14 are still to be added. In general, it was found that when the sunset colors were brilliant and extended to the zenith the polarization was less than on evenings when the colors were not so pronounced.

TABLE 14.—Percentage of polarization of sky light at points at different distances from sun.

On horizontal circle passing through sun.				On horizontal circle passing through point of maximum polarization.			
February 24.				March 3.			
Sun's—		Azimuth from sun.	P.	Sun's—		Azimuth from sun.	P.
Azimuth.	Altitude.			Azimuth.	Altitude.		
°	°	°	Per cent.	°	°	°	Per cent.
310.0	30.2	20	+ 1.5	307.1	30.9	0	+ 1.6
310.0	30.2	40	— 1.7	307.1	30.9	20	+ 2.0
311.0	30.7	60	—12.0	309.1	32.0	40	+ 0.0
311.0	30.7	80	—19.5	309.1	32.0	60	— 1.0
312.9	32.1	100	—22.1	312.0	33.2	80	—17.4
312.9	32.1	120	—11.5	312.0	33.2	100	—18.3
314.4	33.0	140	+ 9.5	313.7	34.5	120	— 6.4
314.4	33.0	160	+24.0	313.7	34.5	140	+13.4
316.0	34.0	180	+34.0	314.5	35.8	160	+40.5
316.0	34.0	200	+30.3	314.5	35.8	180	+45.9
325.0	38.2	220	+26.5	322.6	39.8	200	+42.1
325.0	38.2	240	+ 4.4	322.6	39.8	220	+25.9
326.9	39.0	260	— 8.8	325.1	40.3	240	+ 4.9
326.9	39.0	280	—12.6	325.1	40.3	260	— 7.5
328.3	39.5	300	— 8.9	327.3	41.0	280	—12.2
328.3	39.5	320	— 5.2	327.3	41.0	300	— 8.0
330.1	40.0	340	— 2.0	328.2	41.7	320	— 1.9
Maximum polarization			43.3	328.2	41.7	340	+ 0.9

#### CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that Island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for July, 1903.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1903.	Average.
	Per cent.		Inches.	Inches.
Northeastern division	25	24	4.42	8.19
Northern division	22	53	2.20	3.23
West-central division	26	26	7.79	8.19
Southern division	27	36	2.78	4.36
Means	100	139	4.30	5.99

The rainfall for July was therefore below the average for the whole Island. The heaviest fall was 18.08 inches at Kings Valley in the west-central division; while no rain fell at Irish Town in the northeastern division or at Richmond Pen in the northern division.

#### RECENT PAPERS BEARING ON METEOROLOGY.

Dr. W. F. R. PHILLIPS, Librarian, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with

Since the Pickering polarimeter is not well adapted to measuring the polarization when at a minimum, the position of the neutral points of Arago, Brewster, and Babinet could not be accurately determined. The observations of January 6 and 8 indicate that the position of Arago's neutral point was about 25° above the antisolar point, while those of January 10 indicate that it was about 30° above, but these observations in connection with those of February 24 and March 3 and 25 indicate the presence of neutral belts rather than of neutral points.

the work of the Weather Bureau. Unsigned articles are indicated by a —.

*Science.* New York. N. S. Vol. 18.

Ward, R. DeC. The Climate of Benguet, Philippine Islands. [Note.] Pp. 90-91.

Ward, R. DeC. The Recent Floods. [Note.] P. 91.

Ward, R. DeC. Rainfall and Sunspots. [Review of article by W. J. S. Lockyer.] Pp. 91-92.

Rotch, A. Lawrence. Meteorological Observations with Kites at Sea. Pp. 113-114.

Ward, R. DeC. Climate and Crops in the Argentine Republic. [Review of article by J. Russell Smith.] Pp. 154-155.

Ward, R. DeC. Kite-flying in Scotland and the Cyclone Theory. [Note on article by W. H. Dines.] P. 155.

Ward, R. DeC. Carbon Dioxide in London Railway Carriages. [Note.] P. 155.

Ward, R. DeC. Health on the Isthmus of Panama. [Review of article by Henry L. Abbot.] P. 185.

*Scientific American Supplement.* New York. Vol. 56.

Guarini, Emile. A Method for the Study of Storms. P. 23065.

*Nature.* London. Vol. 68.

Wilson, W. E. Radium and Solar Energy. P. 222.

Thorpe, T. E. "Red Rain" and the Dust Storm of February 22. Pp. 222-223.

Marshall, P. Dust Storms in New Zealand. P. 223.

Shaw, W. N. The Thunderstorm of May 31. P. 247.

Lockyer, William, J. S. On a Probable Relationship between the Solar prominences and Corona. Pp. 257-259.

Lagrange, Ch. The Source of Radium Energy. P. 269.

Lockyer, William J. S. A Multiple Lightning Flash. P. 270.

Bianco, Ottavio Zanotti. The Moon's Phases and Thunderstorms. P. 296.

Boys, C. V. The Passage of Sound through the Atmosphere. Pp. 145-150.

*Quarterly Journal of the Royal Meteorological Society.* London. Vol. 29.

Brodie, Frederick J. The Prevalence of Gales on the Coasts of the British Islands during the 30 years 1871-1900. Pp. 151-171.

Dines, W. H. Formation of Cumulus Cloud. [Reprint from Symons's Meteorological Magazine.] P. 179.

— Shrinkage of the Thames and Lea. [Review of Report by Mr. Fitzmaurice.] Pp. 179-180.

- Baxendell, Joseph.** Note on the Duration of Rainfall. Pp. 181-185.  
— Local Factors influencing Climate. [Review of Article by C. W. Buckley.] P. 188.
- Marriott, William.** Greatest Variations of Temperature. Pp. 222-223.
- Bentley, W. A.** Snow Crystals. [Extract from paper by W. A. Bentley.] Pp. 223-224.  
— Egyptian Meteorology. [Note.] P. 224.  
— Climate of Alexandria. [Summary of meteorological observations.] P. 224.  
— Climate of the East Protectorate. [Review of paper by R. B. Buckley.] Pp. 224-226.
- Symons's Meteorological Magazine.** London. Vol. 38.  
— The Rainfall of June, 1903. Pp. 93-99.
- Wheeler, W. H.** Rainfall in the Lincolnshire Fens, from records kept at Boston. Pp. 99-100.
- Ellis, William.** Cloud Estimation. Pp. 101-102.
- Single, Stanley.** Grass and Shade Minima on a hill and in a valley. P. 102.
- Bulletin of the American Geographical Society.** New York. Vol. 35.  
**Eisen, Gustav.** Notes during a Journey in Guatemala, March-December, 1902. Pp. 231-252.
- Tower, Walter S.** The Climate of the Philippines. Pp. 253-260.
- Ward, R. DeC.** Climatic Control of Railroad Construction and Operation. [Review of article by Robert M. Brown.] Pp. 269-270.
- Ward, R. DeC.** London Fogs. Pp. 270-271.
- Aéronautical Journal.** London. Vol. 7.  
— The Wind Forces overcome in the Experiments of M. Santos Dumont with his Navigable Balloon in Paris 1901. Pp. 49-53.
- Blackden, L. S.** Experiments relative to Equilibrium and Angle of Fall in Gliding Flight. Pp. 53-61.
- Knowledge.** London. Vol. 26.  
**McPherson, J. G.** Murray and Chrystal on "Seiches." P. 172.
- Bell, Arthur H.** Wireless Telegraphy and Weather Forecasting. Pp. 172-174.
- London, Edinburgh, and Dublin Philosophical Magazine.** London. Series A. Vol. 201.  
**Carr, W. R.** On the Laws governing Electric Discharges in Gases at Low Pressures. Pp. 403-433.
- Proceedings of the Royal Society.** London. Vol. 72.  
**Shaw, W. N.** Meteorological Observations obtained by the Use of Kites off the West Coast of Scotland, 1902. Pp. 13-15.
- Chree, Charles.** An Analysis of the Results from the Kew Magnetographs on Quiet Days during the Eleven Years 1890-1900, with a Discussion of certain Phenomena in the Absolute Observations. Pp. 22-24.
- Perman, Edgar Philip.** The Evaporation of Water in a Current of Air. Pp. 72-83.
- National Geographical Magazine.** Washington. Vol. 14.  
**Mosely, E. L.** Rainfall and the Level of Lake Erie. Pp. 327-328.
- Popular Science Monthly.** New York. Vol. 63.  
**Lodge, Oliver.** Modern Views on Matter. Pp. 289-303.
- Ciel et Terre.** Bruxelles. 24me année.  
**L., V. D.** La répartition de l'insolation en Allemagne. Pp. 267-277.
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**Angot, Alfred.** Sur les variations simultanées des taches solaires et des températures terrestres. Pp. 93-97.
- Launay, F. et Maillet, E.** Sur le débit probable des sources pendant la saison chaude de 1903 (1er mai, 1er novembre). Pp. 97-98.
- Garrigou-Lagrange, P.** Sur la cinématographie des mouvements atmosphériques. Pp. 102-106.
- Cœurdevache, P.** Pluie à Paris suivant le cycle lunaire. Pp. 106-107.
- Goutereau, Ch.** La pluie dans le département des Pyrénées-Orientales pendant 50 ans (1851-1900) d'après M. le Dr. Fines. Pp. 109-116.
- Moureau, Th.** Sur les refroidissements et les réchauffements de la température en juin. Pp. 117-118.
- Goutereau, Ch.** La circulation générale de l'atmosphère, d'après M. Hildebrandsson. Pp. 118-120.
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- Esclançon, —.** Sur les lueurs crépusculaires observées à Bordeaux pendant l'hiver 1902-1903. Pp. 1050-1052.
- Meunier, Stanislas.** Pluie de poussière récemment observée en Islande. Pp. 1713-1714.
- Eiffel, G.** Expériences sur la résistance de l'air. Pp. 30-32.
- Thoulet, J.** Étude de la circulation marine. Pp. 97-98.
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**Parville, H[enri] de.** Le cycle solaire et météorologique de trente-cinq ans. Pp. 86-87.
- Plumandon, J. R.** La neige selon l'altitude. Pp. 92-93.
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**Blondlot, R.** Sur l'existence de radiation solaires capables de traverser les métaux, le bois, etc. Pp. 551-553.
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- Hann, Julius.** Die Temperatur von Callao. Pp. 109-110.
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**Polis, P.** Der Gewittersturm vom 26. Juli 1902 in der Rheinprovinz. Pp. 145-158.
- Ziegler, Alfred.** Untersuchung der "Nachtfrostprognose nach Kammernann" für mehrere meteorologische Stationen Nord und Mitteldeutschlands. Pp. 158-162.
- Henze, H.** Ueber den wirtschaftlichen Wert des Wetter-Bureaus. Pp. 164-165.
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- Himstedt, F.** Ueber die Ionisierung der Luft durch wasser. Pp. 107-123.
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- Exner, F. M.** Versuch einer Berechnung der Luftdruckänderungen von einem Tage zum nächsten. Pp. 707-725.
- Valentin, J.** Staubfall vom 9. bis März 1901. Pp. 727-776.
- Elster, J. und Geitel, H.** Messungen der Elektrizitätszerstreuung in der freien Luft. Pp. 946-981.
- Hann, J.** Ueber die tägliche Drehung der mittleren Windrichtung und über eine Oscillation der Luftmassen von halbtägiger Periode auf Berggipfeln von 2 bis 4 km. Seehöhe. Pp. 1615-1711.
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**Mack, K.** Morphologie der Wolken des aufsteigenden Luftstroms. Pp. 289-307.
- Drapczynsky, V.** Ueber die Verteilung der meteorologischen Elemente in der Umgebung der Barometer-Minima und Maxima zu St. Louis in Missouri, Vereinigte Staaten von Nordamerika. Pp. 307-315.
- A. F. Osler. P. 315.
- Prohaska, K.** Ueber Blitzschäden und bemerkenswerte Entladungsformen der atmosphärischen Elektrizität im Jahr 1901. Pp. 315-317.
- Wolfer, A.** Provisorische Sonnenflecken-Relativzahlen. P. 317.
- Busch, —.** Beobachtungen über die gegenwärtig vorliegende Störung der atmosphärischen Polarisation. Pp. 317-319.
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- H[ann], J[ulius].** Die periode der Sonnenflecken und die Variationen der mittleren Jahrestemperatur an der Erdoberfläche. Pp. 320-321.
- Gockel, Albert.** Lufterlektrische Untersuchungen. Pp. 321-322.
- Köppen, W.** Bericht über die Erforschung der freien Atmosphäre mit Hilfe von Drachen. Pp. 322-323.
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- Mülbe, —. und Freunthaller, —.** Meteor am 31. Mai. P. 329.  
— Resultate der meteorologischen Beobachtungen in Santiago de Chile 1888-1891. Pp. 329-331.  
— Klimatabelle für Santiago de Chile. P. 331.  
— Lufterlektrische Messungen auf dem Gipfel des Montblanc. Pp. 331-332.

- Ueber den Ursprung des Wortes "Barometer." Pp. 332-333.  
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## NOTES AND EXTRACTS.

### THE "GUNS" OF LAKE SENECA, N. Y.

In the MONTHLY WEATHER REVIEW for September, 1897, page 393, we have given some account of the "barisal guns," the "mistpouffers," and similar phenomena whose origin is as yet not certainly understood. The following letter describes an analogous phenomenon in Seneca Lake, N. Y., and it may well be that the barisal guns have their origin in the escape of bubbles of gas just as do the "guns" of Seneca Lake.

Mr. Wm. A. Prosser, of Dresden, Yates County, N. Y., writes as follows, under date of August 18, 1903.

So far as I am personally concerned I know of no explosions of inflammable gas, and the newspaper stories are fabrications in this respect.

The "lake guns" are evidently caused by gas escaping from the sand at the bottom.

Long Point is situated about 15 miles south of Geneva, N. Y., and about 25 miles north of Watkins, N. Y., on the west side of Seneca Lake. Directly off the Point the water is very deep. Heavy currents pass either north or south at regular intervals. A heavy wind for a few hours will change the position of the extreme end of land (which extends  $1\frac{1}{2}$  miles eastward) several rods. When the swell is not too heavy you can always see the gas rising in bubble form, which, as a rule, makes very little noise, but larger eruptions evidently produce these "lake guns." The sand would not stay in place were it not for the water holding it there at the extreme point. Large steamers can land there with but the aid of an ordinary gang plank.

I do not know that the gas is inflammable, but I could easily ascertain if it is of any special interest to you. Natural gas is found in considerable quantity within 3 or 4 miles of the point, on the outlet of Keuka Lake, but hardly in paying quantities. However, I am told that a company has been formed that will exploit the gas along the outlet, but not at the Point.

### VARIATION OF GRAVITY OVER THE DEEP SEA.

The last annual report, 1902-3, of Professor Helmholtz, as Director of the Royal Geodetic Institute of Prussia, mentions the result of the work of Professor Dr. Hecker on the measurement of gravity on the open ocean by the comparison of two methods of determining atmospheric pressure, viz, the observation of the mercurial barometer whose records are affected by gravity, and the determination of pressure by the use of the boiling point thermometer, whose indications are not affected by the variation of gravity. Of course, the aneroid barometer could be used instead of the thermometer, but it is not considered to be so reliable. In fact the temperature of the boiling point can not be determined with sufficient accuracy unless every known source of error is most carefully investigated. Professor Hecker's revised computations give the following results: The excess of pressure shown by a mercurial barometer over the pressure shown by the thermohypsometer, is greater when sailing over the shallow part of the ocean than when sailing over the deep sea between Lisbon and Rio Janeiro. On the voyage southward this excess expressed in millimeters of the mercurial column was  $+0.017^{\text{mm}} \pm 0.015^{\text{mm}}$ ; on the return voyage northward the excess was  $+0.048^{\text{mm}} \pm 0.034^{\text{mm}}$ . Combining these two results into one average and converting that from millimeters of barometric pressure into centimeters per second, as the unit of the force of gravity, Professor Hecker's observations show that in general, in this part of the ocean, gravity over shallow seas is greater than that over the deep sea by  $+0.028^{\text{cm}} \pm 0.018^{\text{cm}}$ . The standard force of gravity is 980.6 centimeters per second, so that the diminution over the deep sea is about 0.00003 of gravity, or 3/1000 of one per cent of its full value. From a geographic point of view this result seems to confirm the isostatic hy-

pothesis of Pratt as to the elevations and depressions on the earth's surface. From a meteorological standpoint we see that this change in the force of gravity, as we sail over the ocean, can have but very little influence on the motions of the atmosphere. It is, in fact, of the same order of importance as the gaseous viscosity of the atmosphere, which is sometimes introduced into the equations of motion as friction, but which can be neglected in comparison with the great resistances offered by land *versus* water, mountains *versus* plains, vortical *versus* rectilinear currents, and the mixture of slow moving lower air with rapidly moving upper strata.

### WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. Charles Stewart, Observer, Spokane, Wash., under date of July 9, reports visits from schools and teachers as follows:

January 22, 1903.—The class in physical geography of the Spokane High School.

March 28.—The pupils and teachers of the Holmes Grammar School.

April 10.—A number of the teachers attending the Teachers' Institute.

April 11.—A second visit from the members of the Teachers' Institute.

April 20.—The first section of the class in physical geography of the Spokane High School.

April 24.—The second section of this class.

In all cases the instruments and methods of the Weather Bureau and the determination of atmospheric moisture by the whirled psychrometer were fully explained. These visits and explanations are highly appreciated by the community.

### THE DROUGHTS OF 1901-3.

The distressing drought in Australia has been relieved in many localities but in others it still continues. Mr. Andrew Noble, of Rozelle, near Sydney, New South Wales, calls attention to the fact that we must study the origin or cause of this drought in connection with antarctic conditions "as bringing about a variation in pressure distribution favorable to drought." The following is an extract from his letter of July 4, 1903:

The late drought has had such far-reaching effects in both hemispheres, as shown by the famine in India and Russia,<sup>1</sup> the lowness of the Nile inundations,<sup>2</sup> and the drought in England,<sup>3</sup> that the student will need to look further and deeper for the solution of the whole problem, and your article on the "Physical basis of long-range weather forecasting" (MONTHLY WEATHER REVIEW, December, 1901) shows what a complex problem that is. Dealing with the subject as it seems to affect Australia we find that anticyclones are the controlling force<sup>4</sup> determining our weather, that they are characterized by a steady eastward motion, and that their normal path varies with the sun's apparent journey north and south.

The cyclone only occasionally reaches a full development in our latitude, its place being generally supplied by the V-shaped depression, which remains more or less upright [i. e., capital V with its apex south] if it comes on to our mainland from the Tropics, but inverted [i. e., a capital A with apex north] when it approaches us from the southern

<sup>1</sup> The Russian government has to face the problem of feeding 15,000,000 hungry peasants scattered over central and eastern Russia and partly in the southeast and along the Volga; £200,000 worth of rye has been sent out, and the government has bought an additional £1,500,000 worth of rye and wheat for the same purpose. Cattle are dying by the thousand. (Despatch from St. Petersburg, dated December 27, 1902, reproduced in Sydney Daily Telegraph of February 16, 1903.)

<sup>2</sup> The annual inundation of the Nile has taken place and the flood is the lowest that has ever been recorded. (Cablegram in Sydney Daily Telegraph of August 7, 1902.)

<sup>3</sup> This is the seventh year in which metropolitan rainfall has been less than the average. Such a prolonged period of drought is not recorded since 1845. (English Mechanic, December 13, 1901.)

<sup>4</sup> Vide Russell in Quar. Jour. Roy. Met. Soc., Vol. XIX, No. 85, January, 1893.